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ABSTRACT

The two studies reported here explore recent findings indicating that few relationships exist between environmental stimulation and cognitive development during the first 6 months of life. In the first study, three separate home visits (two 90 minutes and one 30 minutes long) were used to assess the physical and social environments of 100 six-month-old infants from lower- through upper-middle-class homes. Physical environment was assessed through direct observation coded into the 33-item codes of the Purdue Home Stimulation Inventory, which measures specific aspects of the infant's physical environment such as availability of toys and objects, noise confusion, and traffic patterns in the home. Social environment was measured through manual-guided direct observation of the child's interaction with other persons during the course of daily routine. In the second study, a single home visit of 45 minutes was utilized to assess both the physical and social environments of 30 twelve-month-old infants from primarily upper-middle-class environments. Six components of Caldwell's Home Inventory were employed, including emotional and verbal responsivity of mother, avoidance of restriction and punishment, and organization of physical and temporal environment. In both of the studies described, infant cognitive development was assessed through use of a Piagetian-based measure of eight areas of sensorimotor development. Results are discussed. (RH)

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Environmental Factors Related to Cognitive-Intellectual Development

at Two Age Levels: When Does the Environment
Influence Early Intelligence?¹

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Problem

A recent review of the human early experience literature (Wachs & Gruen, 1982) has reported that, for the first 6 months of life, surprisingly few relationships are found between early environmental stimulation and early cognitive development. This lack of relationship is in contrast to studies involving older infants, where a variety of relationships between intelligence and experience are reported. The present paper integrates data from two studies which, taken together, provide a further test of the replicability of this phenomena.

Study I utilized highly detailed, repeated home observations with a large sample of 6-month-old infants from heterogeneous demographic groups. Study II, based on only a single observation, involved a less detailed observational instrument with a smaller sample of 12-month-old infants from homogeneous demographic backgrounds. In both studies the same measure of cognitive development was used. If the above phenomena is not replicable, on purely methodological grounds we would predict consistent environment-development relationships primarily at 6 months, given the large sample size and more detailed study of more varied home environments in Study I as compared to Study II.

Procedure

Subjects

In Study I subjects were 100 six-month-old infants (50 males, 50 females). The socioeconomic range of the sample was from lower class through upper middle class. In Study II subjects were 30 twelve-month-old infants (16 males, 14 females). The socioeconomic status in this sample was primarily upper middle class. In both studies all subjects were full-term babies who were within the normal range of gross motor development for their ages.

Instruments and Method

In Study I three separate home visits, two of 90 minutes each and one of 30 minutes, were used to assess the infant's physical and social environment. The infant's physical environment was assessed through direct observations coded into the 33-item codes of the Purdue Home Stimulation Inventory (PHSI; Wachs, Francis, & McQuiston, 1979). The PHSI codes measure specific aspects of the infant's physical environment such as availability of toys and objects, noise confusion in the home, and traffic patterns in the home. Previous research has indicated satisfactory interobserver reliability, stability and factorial validity for this instrument as well as consistent relationships between specific PHSI items and early cognitive development (Wachs, 1973; 1979; Gottfried & Gottfried, 1981).

The infant's social environment was measured utilizing the Yarrow, Rubenstein and Pederson (1975) "Manual for the Observation of the Home Environment and Mother-Infant Interaction." This measure provides a description of the infant's social environment through direct observation of the child interacting with other persons during the course of the child's daily routine. The 11 summary scores which are derived from this observation tap such dimensions as visual stimulation, tactile stimulation, contingent response to vocalizations and encouraging exploration. Satisfactory interobserver reliability has been reported, and specific Yarrow scale summary scores have been related to various aspects of cognitive development (Yarrow et al., 1975).

In Study II a single home visit of 45 minutes was utilized to assess both the physical and social environment of the infant using the six components of Caldwell's Home Inventory (HOME; Elardo & Bradley, 1981). These components include emotional and verbal responsivity of mother, avoidance of restriction and punishment, and organization of physical and temporal environment. The HOME inventory required both interview and observation. The HOME has been used and validated across a wide

number of early environmental studies, as indicated by a recent review of this instrument (Elardo & Bradley, 1981).

In both Study I and Study II infant cognitive development was assessed in a separate session, by a different examiner, using the Infant Psychological Development Scales of Uzgiris and Hunt (1975;IPDS). The IPDS is a Piaget-based measure of sensorimotor development which measures infant cognitive development in eight specific areas. Areas tapped include object permanence, development of schemes and development of an understanding of causality. Each of the eight subscales consists of a series of separate ordinal steps which delineate the stages of development within a subscale. Evidence supporting the reliability, validity and ordinality of the IPDS has been presented by Uzgiris (1976).

Data Analysis

The data analysis for both studies was the same. At each age level the focus was to determine the relationship between specific environmental and cognitive parameters. Both univariate and multivariate correlations were computed with canonical correlation being the major analytic procedure employed. Canonical correlation is a multivariate correlational procedure which allows the experimenter to obtain the maximum degree of correlation between two sets of components (Harris, 1975). When significant canonical roots were obtained, only items with weights greater than or equal to .40 were retained for data interpretation.

Results

In Study I univariate analysis revealed only scattered significant correlations between environmental measures and cognitive development at 6 months. Specifically only 10% of the physical environment correlations and 15% of the social environment correlations were significantly related to IPDS performance. There was no logically consistent pattern to these scattered significant correlations. Furthermore, multivariate analysis revealed no significant canonical

correlations between the infant's level of sensorimotor development and either the physical or social environmental parameters.

In contrast, for Study II the univariate correlation matrix between environment and sensorimotor development revealed that all HOME scales were positively and significantly related to all aspects of 12 month sensorimotor development. Specifically 71% of the correlations were significant. Rather than attempting to interpret the overall matrix, we utilized canonical correlation as a data reduction technique as shown in Table 1. Canonical analysis revealed one significant root with two predictors and one criterion having weights greater than or equal to .40. Analysis of this pattern indicated that the IPDS subscale foresight was predicted by two HOME subscales, namely, organization of the physical and temporal environment and provision of age-appropriate play materials. Interpretation of this relationship suggests that an organized home environment, rich in age-appropriate play materials, facilitates the transition from Sensorimotor Level 2 to Sensorimotor Level 3. Level 2 is characterized by differentiated action upon objects, whereas Level 3 is characterized by regulation of actions through feedback (Uzgiris, 1976). Such an environment-development relationship is congruent with other findings in the early experience literature (Wachs & Gruen, 1982).

Conclusion and Implications

The present results confirm previous evidence in terms of suggesting little relationship between environment and cognitive development through 6 months of age. In contrast, by 12 months environmental parameters clearly relate to cognitive-intellectual development. In the present study this pattern was obtained despite a variety of methodological factors which predisposed to finding environment-development relationships primarily at 6 months of age. Given this pattern, the obvious question is why the lack of environment-development relationships in the first 6 months. There are a variety of possible hypotheses to account for this

pattern. These include biological buffering of the very young infant against environmental stimulation (Bakeman & Brown, 1980), the relative lack of sensitivity of cognitive measures in the first 6 months (Wachs, 1973) and the possibility of differential sensitivity to the environment by specific groups of infants (Wachs & Gruen, 1982). This last hypothesis has received some empirical support. Evidence has been reported indicating significant environment development relationships prior to 6 months of age for infants who are biologically at risk (Beckwith et al., 1976) and for temperamentally difficult infants (Wachs & Gandour, 1981).

We are currently initiating work to determine if the lack of relationship between environment and development prior to 6 months of age is a genuine case of biological buffering or if alternate factors such as instrument sensitivity or differential reactivity can more plausibly account for these findings. The ultimate conclusion from this and future studies will obviously have major impact upon future decisions regarding the timing of early environmental intervention.

Table 1

Canonical correlations between Environment (HOME Scale)
and Sensorimotor Development (IPDS) at 12 months

I. IPDS subscale:	Weights
Foresight	.44
II. HOME Subscales:	
Organization of Physical-temporal Environment	.58
Provision of appropriate play materials	.43

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